Technology Innovation Project

Project Brief

TIP 262: Demonstration of 2nd Generation Prototype Ducted GE "Brillion" Hybrid Water Heater in the PNNL Lab Homes

Context

This project is being performed under the auspices of the DOE Building Technology Program as part of its Building America (DOE/BA) program and by DOE/Office of Electricity Delivery and Energy Reliability (OE). The DOE/BA program is undertaking a number of R&D and demonstration projects in the residential sector with the goal of reducing existing residential building energy use by 50% by 2015. Hybrid water heaters (HPWHs) are one technology that can be included in the portfolio of technologies to help achieve that goal for homes with electric resistance water heating. The HPWH is the largest savings measure in the residential sector of the Northwest Power and Conservation Council's Sixth Northwest Power Plan.

Description

This proposed project is a field demonstration of the energy performance and demand response of ducted and unducted second-generation GE "Brillion" (smart-grid-enabled) hybrid water heaters in the Pacific Northwest National Laboratory (PNNL) Lab Homes. Previously, HPWH performance and savings have been based entirely on lab testing of individual units and experiments in existing homes. This controlled demonstration will determine the overall performance of an exhaust-air ducted hybrid water heater compared to an identical unducted unit over a heating and cooling season in a matched pair of research homes.

The Lab Homes are a matched pair of highly instrumented, unoccupied homes that will be used as a testing environment for the hybrid water heaters. Following are the main components of the test:

Ducted HPWH Performance: Field test and document the performance of the second-generation GE GeoSpring Hybrid Water Heater with exhaust air in controlled experiments in the PNNL Lab Homes.

Demand Response Characteristics: Field test and document the demand-response characteristics of the same unit to energy price signals.

Supply and Exhaust Air Ducted HPWH Performance: Field test and document the performance of the same unit with both supply and exhaust ducting (simultaneous) in Lab Home B (experimental home).

This proposed project is unique in that it will also characterize the demand response of this second-generation HPWH to various price signals both as a stand-alone appliance and as one appliance among a suite of grid-smart appliances (experimental home). The proposed project also provides factory-built homes to demonstrate and quantify the performance of an HPWH with both supply and exhaust air in a fully instrumented, controlled environment.

Why It Matters

The Northwest Power Planning Council's Sixth Power Plan calls for acquiring 1,200 aMW of efficiency over the 5-year period from 2010 through 2014. Of that amount, BPA has taken responsibility for achieving the public power share, approximately 42%, or 504 aMW of energy savings. The residential sector accounts for more than one-half of the total savings target. This amount is double BPA's previous targets and approximately one and one-half times the energy-efficiency savings achieved from 2005 through 2009. HPWH technology has the potential to provide a significant savings of 492 aMW, the largest in the residential sector.

- The specific impact on the HVAC system and whole-house energy consumption will be documented, as will sound and thermal comfort issues that could affect occupant satisfaction and market acceptance of these technologies.
- This project will also benefit BPA by characterizing the demand response of this second-generation HPWH to various price signals both as a stand-alone appliance and as one appliance among a suite of smart-grid-enabled appliances (experimental home).
- Lastly, this project will benefit BPA's revision to Northwest Energy Efficient Manufactured Housing program (NEEM) specifications that are proposed to significantly increase the energy efficiency of regional manufactured housing.

Goals and Objectives

1. Measure the performance and impact on the Lab Home's heating, cooling, and ventilation of an exhaust air-ducted hybrid water heater compared to a standard electric resistance water heater and an identical unducted unit over a heating and cooling season.
2. Measure and understand the demand response of the hybrid water heater to utility price signals both as a

TIP 262: Demonstration of 2nd Generation Prototype Ducted GE "Brillion" Hybrid Water Heater in the PNNL Lab Homes

stand-alone appliance and interactively with other GE smart-grid-enabled appliances.

3. Measure the performance and impact on the Lab Home's heating, cooling, and ventilation of the GE hybrid water heater with both supply and exhaust air ducting over a heating and cooling season.
4. Measure the energy performance in a controlled experiment in a factory-built home of the GE second-generation Hybrid Water Heater with crawlspace supply air and exhaust air ducting.

Project Start Date: October 1, 2012

Project End Date: January 30, 2014

Reports & References (Optional)

Links (Optional)

http://labhomes.pnnl.gov/

Participating Organizations

DOE
GE Appliances
Northwest Energy Works, Inc

Funding

Total Project Cost:	$201,364
BPA Share:	$98,364
External Share:	$103,000
BPA FY2013 Budget:	$80,508

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